ATTORNEY DOCKET NO. 25002.0007U1

What is claimed is:

1. A method for treating wastewater comprising:

providing a tank having a bottom, an upper aeration chamber, and a lower clarification chamber, the aeration chamber separated from the clarification chamber by a common inclined partition having an opening defined therein, the partition opening into the clarification chamber near the bottom of the tank allowing fluid communication between the aeration chamber and the clarification chamber, the bottom of the tank having a bio-sludge outlet in communication with the clarification chamber;

suppling wastewater to the aeration chamber;

aerating the wastewater within the aeration chamber;

passing aerated wastewater though the inclined partition opening and into the clarification chamber;

settling bio-solids within the clarification chamber to the bottom of the tank;

removing effluent from the clarification chamber of the tank; and

removing settled bio-solids from the clarification chamber of the tank via the bio-sludge outlet of the tank.

2. The method of Claim 1, further comprising:

providing an anoxic chamber within the aeration chamber, the anoxic chamber defined by a second common partition having a top edge, an opposite bottom edge, and a pair of opposing side edges extending from the top edge to the bottom edge thereof, the side edges of the second partition connected to portions of a side wall of the tank so that the top edge is proximate a peripheral edge of the tank and the bottom edge of the second partition is spaced from an upper surface of the inclined partition; and

supplying wastewater to the anoxic chamber.

3. The method of Claim 2, further comprising recirculating a portion of the removed settled bio-solids from the clarification chamber thereinto the anoxic chamber.

4. A wastewater treatment tank having a bottom, an open top, and a continuous side wall extending between the top and the bottom, the bottom of the treatment tank having a bio-sludge outlet, the tank comprising:

an inverted frustoconical partition connected to the side wall of the treatment tank intermediate the bottom and the top thereof, the partition having an upper surface, a lower surface, and an opening defined therein and spaced from the bottom of the tank, the partition dividing the treatment tank into an upper aeration chamber and a lower clarification chamber;

a wastewater inlet line opening into the aeration chamber of the treatment tank;

an effluent discharge outlet line having an intake end positioned within the clarification chamber and an outlet end external of the tank; and

an aerator positioned within the aeration chamber to supply air to the wastewater within the aeration chamber.

5. The tank of Claim 4, wherein the bottom of the treatment tank is formed to have an inverted frustoconical shape.

6. The tank of Claim 4, wherein the bio-sludge outlet is proximate a center of the bottom of the treatment tank.

7. The tank of Claim 4, wherein the intake end of the effluent discharge outlet line is positioned proximate to and below the lower surface of the partition.

8. The tank of Claim 4, wherein the treatment tank is cylindrical and wherein the top of the tank has a peripheral edge.

9. The tank of Claim 8, further comprising:

a bridge member supported on the peripheral edge of the treatment tank;

a drive mechanism supported by the bridge;

a driven assembly coupled to the drive mechanism that includes:

a vertically extending shaft having a distal end, the shaft extending through the opening in the partition such that the distal end of the shaft is spaced from the bottom of the treatment tank; and

at least one rake arm extending generally radially from proximate the distal end of the shaft.

10. The tank of Claim 9, further comprising at least one scraper blade depending from the rake arm for close sliding contact with at least a portion of the bottom of the tank.

11. The tank of Claim 4, further comprising a second partition having a top edge, an opposite bottom edge, and a pair of opposing side edges extending from the top edge to the bottom edge thereof, the side edges of the second partition connected to portions of the side wall of the treatment tank so that the top edge of the second partition is proximate a peripheral edge of the treatment tank and the bottom edge of the second partition is spaced from the upper surface of the frustoconical partition, wherein the second partition forms an anoxic chamber within the aeration chamber of the treatment tank.

12. The tank of Claim 11, wherein the bottom edge of the second partition is spaced from the upper surface of the common partition a first distance and the aerator is spaced from the upper surface of the common partition a second distance, and wherein the second distance is greater than the first distance so that the bottom edge of the second partition extends below the aerator.

13. The tank of Claim 11, wherein the wastewater inlet line opens into the anoxic chamber of the treatment tank.

14. The tank of Claim 13, further comprising:

a bio-sludge recirculation conduit having a first end in communication with the bio-sludge outlet and a second end in communication with the anoxic chamber; and

a pump operably connected to the bio-sludge recirculation conduit so that bio-sludge from the clarification chamber of the treatment tank is passed into the anoxic chamber.

15. The tank of Claim 14, wherein the bio-sludge recirculation conduit is in fluid communication with the wastewater inlet line.

16. The tank of Claim 4, wherein the aerator is selected from a group consisting of a fine bubble diffuser, a coarse bubble diffuser, a jet aerator, an inductor aerator, a low speed mechanical aerator, a high speed mechanical aerator, and combinations thereof.

17. An apparatus for treating wastewater comprising:

a tank having a bottom, an open top, and a continuous side wall extending between the top and the bottom, the bottom of the treatment tank having a bio-sludge outlet, the top of the tank having a peripheral edge;

an inverted inclined partition connected to the side wall of the treatment tank and spaced from the bottom of the treatment tank, the inclined partition having an upper surface, a lower surface, and an opening defined therein, the side wall of the tank and the upper surface of the inclined partition defining an upper aeration chamber, the side wall of the tank, the lower surface of the inclined partition, and the bottom of the tank defining a lower clarification chamber;

a wastewater inlet line opening into the aeration chamber;

an effluent discharge outlet line having an intake end positioned within the

clarification chamber and an outlet end external of the tank; and
an aerator positioned within the aeration chamber.

18. The apparatus of Claim 17, wherein the inclined partition is formed to have an inverted frustoconical shape.

19. The apparatus of Claim 17, wherein the bottom of the tank has a center, and wherein the bottom of the tank has an inclined shape sloping downwardly toward the center.

20. The apparatus of Claim 19, wherein the bottom of the tank has is formed to have an inverted frustoconical shape.

21. The apparatus of Claim 19, wherein the bio-sludge outlet is proximate the center of the bottom of the tank.

22. The apparatus of Claim 17, wherein the tank has a cylindrical shape.

23. The apparatus of Claim 17, wherein the intake end of the effluent discharge outlet line is positioned proximate to and below the lower surface of the inclined partition.

24. The apparatus of Claim 17, further comprising:
a bridge member disposed on portions of the peripheral edge of the tank;
a drive mechanism supported by the bridge;
a driven assembly coupled to the drive mechanism that includes:
an elongate shaft having a distal end, the shaft extending through the opening in the inclined partition such that the distal end of the shaft is spaced from the bottom of the tank;
at least one rake arm extending radially from the shaft; and,

at least one scraper blade depending from the rake arm for close sliding contact with at least a portion of the bottom of the tank.

25. The apparatus of Claim 17, further comprising a second partition having a top edge, a spaced bottom edge, and a pair of opposing side edges extending from the top edge to the bottom edge thereof, the side edges of the second partition connected to portions of the side wall of the tank so that the top edge of the second partition is proximate the peripheral edge of the tank and the bottom edge of the second partition is spaced from the upper surface of the inclined partition, wherein the second partition and the side wall of the tank define an anoxic chamber within the upper aeration chamber of the tank.

26. The apparatus of Claim 25, wherein the bottom edge of the second partition is spaced from the upper surface of the common partition a first distance and the aerator is spaced from the upper surface of the common partition a second distance, and wherein the second distance is greater than the first distance so that the bottom edge of the second partition extends below the aerator.

27. The apparatus of Claim 25, wherein the wastewater inlet line opens into the anoxic chamber of the tank.

28. The apparatus of Claim 27, further comprising:

a bio-sludge recirculation conduit having a first end in communication with the bio-sludge outlet and a second end in communication with the anoxic chamber; and

a pump operably connected to the bio-sludge recirculation conduit so that bio-sludge from the clarification chamber of the tank is passed into the anoxic chamber.

29. The apparatus of Claim 28, wherein the bio-sludge recirculation line is in fluid communication with the wastewater inlet line.

30. The apparatus of Claim 17, wherein the aerator is selected from a group consisting of a fine bubble diffuser, a coarse bubble diffuser, a jet aerator, an inductor aerator, a low speed mechanical aerator, a high speed mechanical aerator, and combinations thereof.

31. A system for treating wastewater having bio-solids therein, comprising:
a tank having a bottom, an upper aeration chamber, and a lower clarification chamber, the upper aeration chamber separated from the lower clarification chamber by a common inclined partition having an opening defined therein, the inclined partition opening into the clarification chamber near the bottom of the tank and allowing fluid communication between the upper aeration chamber and the lower clarification chamber, the bottom of the tank having a bio-sludge outlet for removal of settled bio-solids;
a wastewater inlet line opening into the aeration chamber;
an effluent discharge outlet line having an intake end positioned within the clarification chamber and an outlet end external of the tank; and
an aeration source positioned within the aeration chamber.

32. The system of Claim 31, wherein the inclined partition is formed to have a frustoconical shape.

33. The system of Claim 31, wherein the bottom of the tank has a center, and wherein the bottom of the tank is formed to have an inverted frustoconical shape sloping downwardly toward the center.

34. The system of Claim 31, wherein the tank has an open top having a peripheral edge, further comprising:
a bridge member supported on the peripheral edge of the tank;
a drive mechanism supported by the bridge;
a driven assembly coupled to the drive mechanism that includes:

a downwardly extending elongate shaft having a distal end, the shaft extending through the opening in the inclined partition such that the distal end of the shaft is spaced from the bottom of the tank;

at least one rake arm extending generally radially from the shaft; and,

at least one scraper blade depending from the rake arm for close sliding contact with at least a portion of the bottom of the tank.

35. The system of Claim 31, wherein the tank has an open top having a peripheral edge and a side wall extending from the top to the bottom of the tank, further comprising an anoxic chamber defined within the aeration chamber by a second common partition having a top edge, an opposite bottom edge, and a pair of opposing side edges extending from the top edge to the bottom edge thereof, the side edges of the second partition connected to portions of the side wall of the tank so that the top edge of the second partition is proximate the peripheral edge of the tank and the bottom edge of the partition is spaced from an upper surface of the inclined partition, wherein the anoxic chamber is within the aeration chamber of the tank.

36. The system of Claim 35, wherein the bottom edge of the second partition extends below the aeration source within the aeration chamber.

37. The system of Claim 35, wherein the wastewater inlet line opens into the anoxic chamber of the tank.

38. The system of Claim 37, further comprising:

a bio-sludge recirculation conduit having a first end in communication with the bio-sludge outlet and a second end in communication with the anoxic chamber; and

a pump operably connected to the bio-sludge recirculation conduit so that bio-sludge from the clarification chamber of the tank is passed into the anoxic chamber.

39. The system of Claim 38, wherein the bio-sludge recirculation line is in fluid communication with the wastewater inlet line.

40. The system of Claim 31, wherein the aeration source is selected from a group consisting of a fine bubble diffuser, a coarse bubble diffuser, a jet aerator, an inductor aerator, a low speed mechanical aerator, a high speed mechanical aerator, and combinations thereof.

41. The system of Claim 31, wherein the intake end of the discharge outlet line is positioned adjacent, and below the inclined partition.

42. A method for treating wastewater comprising:

providing a tank having a bottom, an upper aeration chamber, and a lower clarification chamber, the aeration chamber separated from the clarification chamber by a common inclined partition having an opening defined therein, the partition opening into the clarification chamber near the bottom of the tank allowing fluid communication between the aeration chamber and the clarification chamber, the bottom of the tank having a bio-sludge outlet in communication with the clarification chamber;

suppling wastewater to the aeration chamber;

aerating the wastewater within the aeration chamber;

passing aerated wastewater though the inclined partition opening and into the clarification chamber;

settling bio-solids within the clarification chamber to the bottom of the tank;

removing effluent from the clarification chamber of the tank;

removing settled bio-solids from the clarification chamber of the tank via the bio-sludge outlet of the tank; and

supplying a portion of the removed settled bio-solids to the aeration chamber of the tank.

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43. A system for treating wastewater having bio-solids therein, comprising:

a tank having a bottom, an upper aeration chamber, and a lower clarification chamber, the upper aeration chamber separated from the lower clarification chamber by a common inclined partition having an opening defined therein, the inclined partition opening into the clarification chamber near the bottom of the tank and allowing fluid communication between the upper aeration chamber and the lower clarification chamber, the bottom of the tank having a bio-sludge outlet for removal of settled bio-solids;

a wastewater inlet line opening into the aeration chamber;

an effluent discharge outlet line having an intake end positioned within the clarification chamber and an outlet end external of the tank;

a bio-sludge recirculation conduit having a first end in communication with the bio-sludge outlet and a second end opening into the aeration chamber of the treatment tank so that a portion of the bio-sludge removed from the clarification chamber of the tank is passed into the aeration chamber; and

an aeration source positioned within the aeration chamber.